External assessment 2026

Multiple choice question book

Specialist Mathematics

Paper 1 — Technology-free

General instruction

- Work in this book will not be marked.
- Predicted paper written by Tangent Tuition. Not QCAA material.

Section 1

Instruction

- Respond to these questions in the question and response book.

QUESTION 1

Use the substitution $u = \cos(x)$ to determine $\int \sin(x)\cos^3(x)\,dx$.

(A) $\frac{1}{4}\cos^4(x) + c$

(B) $-\cos^4(x) + c$

(C) $-\frac{1}{4}\cos^4(x) + c$

(D) $\frac{1}{4}\sin(x)\cos^4(x) + c$

QUESTION 2

Consider a proof of the proposition $\sum_{r=1}^{n} r(r+2) = \frac{n(n+1)(2n+7)}{6}\ \forall n \in Z^+$ using mathematical induction.

Assuming the proposition is true for $n = k$,

$$\sum_{r=1}^{k} r(r+2) = \frac{k(k+1)(2k+7)}{6}.$$

Within the proof of the inductive step, $\sum_{r=1}^{k+1} r(r+2)$ could be expressed as

(A) $\frac{k(k+1)(2k+7)}{6} + (k+1)(k+3)$

(B) $\frac{k(k+1)(2k+7)}{6} + k(k+2)$

(C) $\frac{k(k+1)(2k+7)}{6} + \frac{(k+1)(k+2)(2k+9)}{6}$

(D) $\frac{(k+1)(k+2)(2k+9)}{6} + (k+1)(k+3)$

QUESTION 3

Let $P(z)$ be a cubic polynomial with real coefficients such that $P(3-2i) = 0$.

Let $Q(z) = (z-i)\,P(z)$.

Which statement must be true?

(A) $P(-3+2i) = 0$

(B) $P(-3-2i) = 0$

(C) $Q(-i) = 0$

(D) $Q(3+2i) = 0$

QUESTION 4

The vectors $2\hat{\boldsymbol{i}} - 3\hat{\boldsymbol{j}} + \hat{\boldsymbol{k}}$ and $m\hat{\boldsymbol{i}} + 2\hat{\boldsymbol{j}} + 8\hat{\boldsymbol{k}}$ are perpendicular.

Determine the value of m.

(A) -7

(B) -1

(C) 1

(D) 3

QUESTION 5

A random variable X has mean μ and standard deviation σ. The distribution of the sample mean for random samples of size 25 is approximately $\bar{X} \sim N(80, 4)$.

The value of σ is

(A) 2

(B) $2\sqrt{5}$

(C) 10

(D) 20

QUESTION 6

The augmented matrix shown is produced when a Gaussian elimination technique is used to solve a certain system of equations with three variables. Each equation represents a plane.

$$\left[\begin{array}{ccc|c} 1 & -1 & 2 & 4 \\ 0 & 1 & -3 & 1 \\ 0 & 0 & 0 & 5 \end{array}\right]$$

Which statement is true?

(A) The system has no solution, and there is no point common to all three planes.

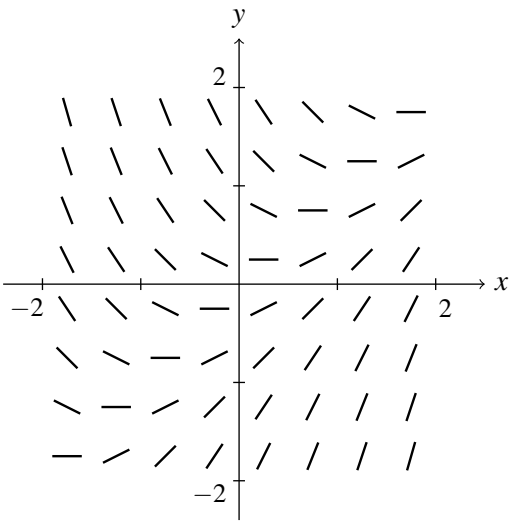
(B) The system has a unique solution, and the three planes intersect at a single point.

(C) The system has infinitely many solutions, and the three planes intersect along a line.

(D) The system has no solution, and the three planes are parallel.

QUESTION 7

The diagram shows a slope field.



The differential equation represented by the slope field is

(A) $\frac{dy}{dx} = x + y$

(B) $\frac{dy}{dx} = y - x$

(C) $\frac{dy}{dx} = x - y$

(D) $\frac{dy}{dx} = x$

QUESTION 8

The acceleration (m s^{-2}) of a particle moving in simple harmonic motion is given by $a = -9x$, where x is its displacement (m) from the origin.

The period of the motion in seconds is

(A) $\frac{2\pi}{9}$

(B) $\frac{2\pi}{3}$

(C) 3

(D) 6π

QUESTION 9

Three forces, $(2\hat{\boldsymbol{i}} + 3\hat{\boldsymbol{j}})$ N, $(5\hat{\boldsymbol{i}} - \hat{\boldsymbol{j}})$ N and $(-\hat{\boldsymbol{i}} + 6\hat{\boldsymbol{j}})$ N, act concurrently on a particle of mass 2 kg. No other forces act on the particle.

The acceleration ($\mathrm{m\,s^{-2}}$) of the particle is

(A) $3\hat{\boldsymbol{i}} + 4\hat{\boldsymbol{j}}$

(B) $6\hat{\boldsymbol{i}} + 8\hat{\boldsymbol{j}}$

(C) $12\hat{\boldsymbol{i}} + 16\hat{\boldsymbol{j}}$

(D) $2\hat{\boldsymbol{i}} + \frac{8}{3}\hat{\boldsymbol{j}}$

QUESTION 10

Two researchers each select a random sample of size 50 from the same population, which has an unknown mean μ. Each researcher uses their own sample mean and sample standard deviation to calculate an approximate 95% confidence interval for μ.

Which statement is true?

(A) The two intervals will be identical.

(B) Both intervals will contain μ.

(C) The two intervals will have the same width.

(D) Each interval may or may not contain μ.

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